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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/630,164

07/30/2003

Kiran R. Desai

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07/17/2006

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EXAMINER

THOMAS, SHANE M

ART UNIT

PAPER NUMBER

2186

DATE MAILED: 07/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/630,164	DESAI, KIRAN R.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Shane M. Thomas	2186	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 01 May 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,7-9,11-19,21-29,31 and 32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,2,4,5,24-29 and 31 is/are allowed.
- 6) ☒ Claim(s) 7-9,11-13,17-19,21,22 and 32 is/are rejected.
- 7) ☒ Claim(s) 14-16 and 23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### Remarks

Prosecution of this case has been assumed by Examiner Shane Thomas.

This Office action is responsive to Applicant's response filed 5/1/2006. Claims 1,2,4,5,7-9,11-19,21-29,31 and 32 are currently pending; claims 3,6,10,20, and 30 have been canceled. Upon a subsequent search of the prior art, a new reference has been found that anticipates amended claim 32, which was previously rejected under 35 U.S.C. §112, second paragraph, but was indicated as being allowable if corrected and rewritten in independent form. As such, this action has been made **Non-Final** to give Applicant the opportunity to review the rejection.

In the response to this Office action, the Examiner politely requests that support be shown for language added to any original claims on amendment and any new claims. That is, indicate support for newly added claim language by specifically pointing to page(s) and line numbers in the specification and/or drawing figure(s). This will assist the Examiner in prosecuting this application.

Excerpts from all prior art references cited in this Office action shall use the shorthand notation of [column # / lines A-B] to denote the location of a specific citation. For example, a citation present on column 2, lines 1-6, of a reference shall herein be denoted as "[2/1-6]."

***Information Disclosure Statement***

The information disclosure statement (IDS) submitted on 5/1/2006 has been considered by the Examiner. A signed copy has been attached herewith.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 17, 18, and 32, are rejected under 35 U.S.C. 102(e) as being anticipated by Pentkovski et al. (U.S. Patent Application Publication No. 2004/0039880).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention “by another,” or by an appropriate showing under 37 CFR 1.131.

As per claim 17, Pentkovski teaches a **first cache memory 210 (figure 2) and a second cache memory 220 operatively coupled to the first cache memory (as shown) where the second cache memory being structured to issue an inquiry (snoop - figure 3c, step 344) to the first cache memory if a cache line to be victimized in the second cache memory is in an**

**enhanced modified state (Mstale). The enhanced modified state indicating a copy of the cache line may be in the first cache memory (refer to Table 1 below ¶24), and the second cache memory is structured to perform a write-back of the cache line from the second cache (figure 3d, step 350) without issuing the inquiry to the first cache (figure 3d, step 349 shows no snoop to L1) if the cache line is in a non-enhanced modified state (MMRC state - step 346).**

As per claims 18, Pentkovski teaches **the first cache memory is an L1 cache and the second cache memory is an L2 cache** in figure 2.

As per claim 32, Pentkovski teaches **a processor 205, a first cache 210 operatively coupled to the processor and a second cache 220 operatively coupled to the processor, the second cache being structured to post a snoop hit signal (L1 is snooped and modified data may be hit in step 354 of figure 3e) if a cache line in the second cache is in one of an exclusive state, an enhanced exclusive state (which the Examiner is considering to be the Mstale state in this case), and a shared state, wherein the enhanced exclusive state (Mstale) indicates a modified copy of the cache line is in the first cache (refer to Table 1 below ¶24 of Pentkovski).** Pentkovski further teaches **the second cache is structured to detect a snoop hit-modified signal (snoop is a hit modified since the data is modified as shown in step 354) from the first cache and invalidate (step 354) the cache line in the second cache in response to detecting the snoop hit-modified signal from the first cache.** Once the hit-modified is detected, the L2 state of the cache line is shown to transition to invalid. Refer also to claim 23 of Pentkovski which shows that the caches use the internal snoop bus to transfer data in response to snoop cycles.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-9,11-13,19,21, and 22, are rejected under 35 U.S.C. 103(a) as being obvious over Merrell et al. (U.S. Patent No. 5,829,038) in view of Pentkovski et al. (U.S. Patent Application Publication No. 2004/0039880).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention “by another”; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

As per claim 7, Merrell teaches **a method of victimizing a cache line in a second cache** (figure 2) but does not teach multiple Modified states (i.e. enhanced modified and non-enhanced modified). Pentkovski teaches such states: Mstale (which is an enhanced modified state that indicates that the cache line has been modified and has a stale copy of the cache line with another L1 cache containing the most recent copy) and MMRC (a non-enhanced modified state that indicates that the cache line contains the most up to date copy). The use of both states allows the system of Pentkovski to detect in which cache layer the most recent copy of a cache line resides. Pentkovski further teaches in ¶40 that by using an internal snoop interconnect, additional bandwidth is provided for cache-to-cache transfers that would otherwise clog a single-bus system. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the caching system of Merrell with the snooping bus and unique cache state system of Pentkovski in order to have provided additional bandwidth and thereby avoiding the degradation of system bus resources of Merrell, especially when transferring cache data between multiple caches as taught in [2/16-24] of Merrell.

Thus modified Merrell teaches **if the cache line is in an enhanced modified state** (Mstale), **issuing an inquiry to a first cache** (figure 2, step 203 of Merrell or step 344 of figure 3c of Pentkovski), **receiving a response to the inquiry** (step 204), **victimizing the cache line in the second cache** (step 209) **without a write-back of the cache line** (step 205) **if the response is indicative of a cache hit and if the cache line is in a non-enhanced modified state** (MMRC), **performing a write-back of the cache line from the second cache without issuing the inquiry to the first cache** (figure 3d of Pentkovski - step 349 teaches that no snoop to L1 required when cache line is in MMRC state of the L2 cache).

As per claim 8, **the first cache is an L1 cache and the second cache is an L2 cache** (refer to figure 1 of Merrell or figure 2 of Pentkovski).

As per claim 9, **the enhanced modified state indicates a copy of the cache line may be in the first cache** (refer to Table 1 below ¶24 of Pentkovski).

As per claim 11, it can be seen that the **inquiry is an internal inquiry as it occurs within the system 15** (figure 1) of modified Merrell [3/46-59].

As per claims 12 and 21, Merrell teaches **performing a write-back (steps 203) of the cache line from the second cache if the response is indicative of cache miss** (“No” path of step 204).

As per claims 13 and 22, Merrell teaches **victimizing the cache line in the second cache after performing the write-back if the response is indicative of a cache miss** (step 209).

As per claim 19, the rejection follows the rejection of limitations (b) and (c) of claim 7 above. Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the cache system of Pentkovski with the write-back teachings of Merrell in order to have reduced the number of write-back operations performed by the L2 cache of Pentkovski (abstract of Merrell), thereby saving system bandwidth of Pentkovski.



*Allowable Subject Matter*

Claims 1,2,4,5,24-29, and 31 are allowable over the prior art of record.

Claims 14-16 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As per claims 1 and 4, the prior art of record does not teach or suggest, alone or in combination, all of the limitations of the claims.

As per claims 14 and 23, the prior art of record does not teach or suggest, alone or in combination, all of the limitations of the claims.

As per claims 24-28, the claims were previously indicated as being allowable in the prior Office action filed 11/23/2005.

As per claim 29, the claim has been amended to include the limitations in previous claim 30, which were deemed allowable in the aforementioned Office action.

Claims 2,5, and 31, are allowable as being dependent on an allowable base claim.

Claims 15,16 are objected to as being dependent upon an objected base claim.

Art Unit: 2186

*Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shane M Thomas whose telephone number is (571) 272-4188.

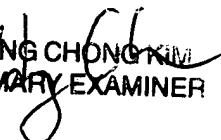
The examiner can normally be reached M-F 8:30 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M Kim can be reached at (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shane M. Thomas



HONG CHONG KIM  
PRIMARY EXAMINER